MIL-M-15071E(SHIPS)
15 April 1962
SUPERSEDING
MIL-M-15071D(SHIPS)
6 June 1961
MIL-M-16616(SHIPS)
4 February 1956

MILITARY SPECIFICATION

MANUALS, EQUIPMENT AND SYSTEMS

1. SCOPE

1.1 Scope. - This specification sets forth Bureau of Ships requirements for manuals necessary for installation, operation, maintenance, and repair (without the services of manufacturer's representatives) of equipment and systems.

1.2 Classification. - Manuals shall be of the following types, as specified (see 6.1):

Type I - Electrical and mechanical equipment manuals.
Type II - Electronic and specialized equipment manuals.
Type IIa - Experimental equipment manuals.
Type III - Systems manuals.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitations for bids, form a part of this specification to the extent specified herein:

SPECIFICATIONS

MILITARY

MIL-D-963 - Drawing, Electrical, Hull and Mechanical Equipment for Naval Shipboard Use.
MIL-M-21741 - Manual, Technical, Maintenance Standard Book.
MIL-D-23140 - Drawing, Installation Control and Preliminary Data (for Electronic and Related Equipment).

STANDARDS

MILITARY

MIL-STD-12 - Abbreviations for Use on Drawings and in Technical-Type Publications.
MIL-STD-15-1 - Graphical Symbols for Electrical and Electronic Diagrams, Part 1.
MIL-STD-15-2 - Electrical Wiring Symbols for Ships' Plans, Part 2.
MIL-STD-15-3 - Electrical Wiring Symbols for Architectural and Electrical Layout Drawings, Part 3.
MIL-STD-16 - Electrical and Electronic Reference Designations.
MIL-STD-17 - Mechanical Symbols.
MIL-STD-806 - Graphic Symbols for Logic Diagrams.

PUBLICATIONS

DEPARTMENT OF DEFENSE

DD Form 441 (Attachment) - Industrial Security Manual for Safeguarding Classified Information.

BUREAU OF SHIPS

NAVSHIPS 250-000 - Bureau of Ships Technical Manual
NAVSHIPS 94500 - Preparation Guide for Electronic Equipment Technical Manuals.
NAVSHIPS 900, 000. 102 - Handbook of Electronic Circuits.

(Copies of specifications, standards, and publications required by contractors in connection with specific procurement functions may be obtained from the bureau or activity concerned or as directed by the contracting officer.)

2.2 Other publications. - The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

AMERICAN STANDARDS ASSOCIATION (ASA)
Y14.15 - Electrical Diagrams.

(Applications for copies should be addressed to the American Standards Association Inc., 10 East 40th Street, New York 16, N.Y.)

OFFICIAL CLASSIFICATION COMMITTEE
Uniform Freight Classification Rules.

(Applications for copies should be addressed to the Official Classification Committee, 1 Park Avenue at 33rd Street, New York 16, N. Y.)

FSC 7610

3. REQUIREMENTS

3.1 Level of writing. - As a general guide, the level of writing should be that for a high school graduate having specialized training as a technician through Navy training courses. Operating instructions shall be written to the level of an operator having previous experience in the operation of similar or related equipment. The level of writing for other portions of the manual shall be to that of a technician having previous maintenance experience with similar or related equipment. These manuals are required to be written to the level of understanding of a Navy Technician Third Class. Technical manuals for experimental equipment (type IIa) should be written to the level of understanding of an engineer. To help contractors determine the nature, content and level of training given in the Navy Class A schools, manufacturers may request Inspectors of Naval Material to requisition training material on loan for the duration of the need.

3.2 References. - The Bureau of Ships Technical Manual, NAVSHIPS 250-000, describes the theory, operation and maintenance of many equipments and systems. Common electronic circuits are described in the Handbook of Electronic Circuits, NAVSHIPS 900,000.102. Accordingly, it will not be necessary to repeat this type of data in equipment or systems manuals except by reference. New or unique applications shall be fully described, to acquaint the technician with their principles of operation and maintenance.

3.3 Contents. - Manuals shall contain the following data, as applicable, arranged in an appropriate order to provide adequate instruction for installation, operation and maintenance of the equipment or system:

Front matter
General information
Installation
Operation
Trouble shooting
Maintenance
Parts list
Index

3.3.1 Front matter. - Standard front matter, listed in the normal sequence of appearance, shall consist of the following:

3.3.1.1 Cover and title page. - The cover shall contain the information shown in figure 1. The title page shall contain the information shown in figure 2.

3.3.1.2 Approval and procurement record page. - For type I manuals only, the approval and procurement record (APR) page shall follow the title page, and shall conform to figure 3.

3.3.1.3 List of effective pages. - The list of effective pages shall list all pages of the manual and shall indicate the issue information of each page (see 3.10.2.3). In multi-volume manuals, this page shall be included in volume 1 only.

3.3.1.4 Table of contents. - The table of contents shall list all primary divisions (chapters, sections, and paragraphs), with their corresponding page numbers. In multi-volume manuals, volume 1 shall contain a complete table of contents for all volumes; each subsequent volume shall contain its own table of contents.

3.3.1.5 List of illustrations. - The list of illustrations shall contain a complete listing of figures, titles, and page numbers. In multi-volume manuals, volume 1 shall contain a complete list of illustrations; each subsequent volume shall contain its own list of illustrations.

3.3.1.6 List of tables. - The list of tables shall contain a complete listing of all tables, titles, and page numbers. In multi-volume manuals, volume 1 shall contain a complete list of tables; each subsequent volume shall contain its own list of tables.

3.3.2 General information. - The manual shall include an over-all description of the functions and purpose of the equipment. This information is intended for use at the command level and others requiring a general summary of the equipment or system and its performance, advantages and limitations. It should not include information on operation and maintenance.

3.3.2.1 Description. - The functioning of the equipment or system as a whole and of its interrelated units shall be described. The functional description shall be non-technical in nature and shall describe the intended use (why, where, when, and with what), capabilities, and limitations of the equipment or system. Text covering physical descriptions or structural arrangements shall be brief, with special attention given to avoiding the inclusion of unnecessary or repetitious details that are easily illustrated. If the manual covers more than one model equipment or system, a statement or table pointing out the differences shall be provided. A list of equipment supplied, together with the approximate volume, weight, and over-all dimensions of each unit, if applicable, shall also be included. A list of equipment or publications required but not supplied and a compilation of quick reference data shall also be included. The quick reference data shall consist of pertinent technical or design characteristics of the equipment. Examples of such data are:

(a) Descriptive (nameplate) data necessary to identify manufacturer, type, model.

(b) Functional characteristics, such as:
Power requirement
Types of operation
Power output
Frequency
Pulse characteristics
Sensitivity; selectivity
(c) Capabilities, such as:
Rated ranges
Coverage
Resolution
Accuracy
(d) Rated outputs, such as:
Wattages
Voltages
Horsepower
Gallons per minute
(e) Special characteristics, such as:
Operating temperatures
Heat dissipation per unit
Pressure
Humidity
Tolerances
(f) Other pertinent characteristics

3.3.3 Installation. - Installation information, as necessary to summarize installation drawings (conforming to MIL-D-963 or MIL-D-23140, as applicable), such as: site selection, unpacking and handling (where abnormal procedures or precautions are required), preparation of foundations, power requirements, mechanical assembly procedures, mounting instructions, bolting diagrams, safety precautions or guards, grounding and bonding, clearances for access, ventilation, motion under shock, methods of testing to assure satisfactory installation, and other recommendations for reduction of electrical or radio interference shall be provided. Information shall also be included to describe and illustrate, as necessary, the procedures to prepare the equipment for reshipment, taking into account complicated disassembly or dismantling procedures and known requirements for special handling of the equipment.

3.3.4 Operation. - Operating instructions shall include routine and emergency procedures (manual, automatic, local, and remote), safety precautions, quantitative and qualitative limits to be observed in the starting, operating, stopping, or shutting down of the equipment or systems. Where operating procedures or adjustments are to be performed in a specific sequence, step-by-step procedures shall be given; tables or charts, as necessary, are preferred for the presentation of such procedures. Adequate illustrative material shall supplement the text, to identify and locate all operating control and indicating devices. Tables which present the function of each operating control and indicating device, as well as the normal in-use position or indication, shall be included. Operating and stand-by cycling time for maximum over-all equipment life shall also be included. Emergency operating instructions shall describe procedures to be followed when normal operation is not possible because of emergency conditions, such as: power failure, "battle short" operation, control air failure, lube-oil failure, partial failure of equipment, and so forth.

3.3.4.1 Operator's maintenance. - It is the intent of this specification that the operator's information include any maintenance procedures within the capability of an operator. This capability is limited to procedures governing periodic inspection, cleaning, servicing, preservation, lubrication, adjustment, and minor parts replacement (fuses, dry batteries, indicator lamps, and so forth) which do not require the need for internal alignment or complex adjustment.

3.3.5 Trouble shooting. - The manual shall provide the maintenance technician with adequate details for quickly and efficiently locating the cause of an equipment malfunction. The discussions shall contain concise information (to the extent needed) on how the equipment operates. The discussions shall be in order of operational or data sequence, as applicable. Block diagrams, simplified schematic diagrams of electrical, mechanical, hydraulic, pneumatic, and electronic circuits or systems, performance curves, and nomographs shall be used to support the discussions wherever necessary. Trouble-shooting information required to localize any trouble to a particular functional division (or unit) shall be included, to serve as a guide in isolating faults.

3.3.6 Additional specific requirements for types I, II, and III manuals are set forth in paragraphs (3.4), (3.5) and (3.6), respectively.

3.3.7 Parts list. - The parts list shall include identification data covering all maintenance parts, to facilitate ready identification of the parts for replacement and ordering purposes. Standard hardware, structural parts, or other parts which have no maintenance significance shall not be listed. A brief introduction and the applicable tables listed below shall be included:

3.3.7.1 List of units. - The units shall be listed by unit number in numerical order; the list shall also indicate the quantity per equipment and the official name and designation.

3.3.7.2 Maintenance parts list. - The maintenance parts list shall list all of the units and their maintenance parts. The listing shall be arranged by units in numerical sequence. Maintenance parts for each unit shall be listed alphabetically-numerically by class of part following the unit designation:

(a) The tabulation shall consist of the following data: reference designation (military

Standards Book as covered by MIL-M-21741). The instructions shall include, where appropriate:

(a) A maintenance procedures summary and time schedule chart.
(b) A tabulation of periodic performance, mechanical and electrical tests and checks, cleaning and inspections, and lubrication. Each of the checks or procedures shall be properly illustrated, and a regular time interval of performance shall be established (such as daily, weekly, monthly, and so forth). Acceptable limits of performance shall also be included within the tabulations. In general, the information shall indicate when it is to be done, what is to be done, how to do it, and the expected result.
(c) Lubrication instructions shall include manufacturer's recommendations on types of lubricant to use, specific time intervals for lubrication, and, where necessary, any special instructions covering lubricating procedures. Lubricants shall be identified by military or commercial standard numbers, as available.
(d) Cleaning instructions shall include information on the types of solvents to use and the cleaning periods. The cleaning solvents shall be identified by military or commercial standard numbers, as available.

3.5.3.2 Repair. - Instructions shall be provided for the removal, repair, adjustment, and replacement of all items which are within the ability of a technician to perform. Schematic diagrams of electrical, mechanical, hydraulic, pneumatic, and electronic circuits; parts location illustrations or other methods of parts location information; photographs, inter-connection cabling, piping plans, intra-rack wiring data (diagrams or tabular listings), and exploded and sectional views giving details of mechanical assemblies shall be provided, as necessary, to supplement the test. For mechanical items, information on tolerances, clearances, wear limits, maximum bolt-down torques, and in-place balancing or other means of reducing noise level shall be supplied. Information on the use of special tools and test equipment supplied with the equipment, as well as any cautions or warnings which must be observed to protect personnel and equipment, shall also be covered. The presentation should be arranged on a unit-by-unit basis; however, extensive material, procedures, or illustrations which are common to more than one assembly or sub-assembly need not be repeated, but may be referenced.

3.5.4 Operators' handbook. - When the thickness of the manual exceeds approximately 1/2 inch, the operators' information required in 3.3.4 shall be bound as a separate "Operators' Handbook". When bound separately, the standard front matter specified in 3.3.1 shall be included in the handbook.

3.6 Specific requirements for type III manuals. - Systems manuals shall contain data required for type I or type II manuals arranged in an appropriate order to provide system oriented instructions for overall operation, checkout, and maintenance of the system. Detailed requirements for these manuals shall be as specified in the contract, order, or ship specification. Parts lists of units involved with systems not already covered in equipment manuals shall be included.

3.7 Format. -

3.7.1 Volumes. - When the thickness of a manual exceeds approximately 2 inches, the manual shall be divided functionally into volumes and chapters or sections, as necessary, to provide easy handling and to present orderly instructions.

3.7.2 Text. - The text shall be specific, concise, and clearly worded to be readily understandable by personnel involved in the operation, maintenance, and repair of the equipment.

3.7.3 Emphasis. - The Bureau of Ships is mainly interested in the adequacy and completeness of contents and the clarity and readability of the information rather than the format. The manual shall be oriented toward operation, maintenance and repair of the equipment by the forces afloat, without the services of a manufacturer's representative. The portions devoted to descriptive matter and theory shall be limited to those which are essential to a proper understanding of the equipment for satisfactory operation, maintenance and repair. The text need not duplicate information which is adequately shown on the photographs, drawings and illustrations incorporated in the manual.

3.7.4 Security classification. - The security classification of a manual shall be as designated by the bureau or agency concerned. The Security Requirements Check list DD Form 254, which constitutes a part of the contract for all classified material, identifies and indicates the classified features. All pages of classified manuals shall be marked in accordance with Industrial Security Manual for safeguarding classified information. Whenever possible, the installation, operation, and parts list information shall be kept unclassified.

3.7.4.1 Additional security markings. - When a manual contains information of a higher classification than that of the equipment it concerns, the appropriate classification of all classified data

contained within that manual shall be identified by a classification letter(s) enclosed in parentheses (see 3.7.4.2) and positioned as follows:

(a) Paragraphs and subparagraphs. - At the beginning and end of the text.
(b) Tables and illustrations. - At the upper-left and lower-right corners.
(c) Subjects and titles. - At the end of the subject or title.

3.7.4.2 Classification letters. - The classification letters assigned to the various levels are: (TS) Top Secret, (S) Secret, (C) Confidential, and (CMH) Confidential—Modified Handling Authorized, and (CRD) Confidential Restricted Data. Although it is not intended that each and every item of information bear a classification letter, the letter (U) shall be used to denote unclassified data when so directed by the bureau or agency concerned.

3.7.5 Notes, cautions, and warnings. - Notes, cautions, and warnings shall be used to emphasize important and critical instructions, consistent with the need. Notes, cautions, and warnings shall immediately precede the applicable instructions, and shall be selected in accordance with the following:

(a) "NOTE" - Concerns an operating procedure or condition which should be highlighted.
(b) "CAUTION" - Concerns an operating procedure or practice, which if not strictly observed, will result in damage to or destruction of equipment.
(c) "WARNING" - Concerns an operating procedure or practice which, if not strictly observed, will result in injury to personnel or loss of life.

3.7.6 Numbering and identification. - Any chapter, section, page, and paragraph numbering system is acceptable if it facilitates adequate indexing and location of information.

3.7.7 Illustrations. - Illustrations perform the function of graphically presenting required information. They shall be so planned and laid out as to portray complete pertinent information in a clear and accurate manner. Contractors may use available illustrations (photographs, diagrams, and so forth) prepared for other publications if the illustrations conform to this specification.

3.7.8 Abbreviations. - Abbreviations for use on drawings shall conform to MIL-STD-12, or MIL-D-963, as applicable.

3.7.9 Graphical symbols. - For type I manuals, use graphical symbols from MIL-D-963. For type II manuals, use graphical symbols for electronic diagrams from MIL-STD-15-1; electronic wiring equipment symbols from MIL-STD-15-2; electronic wiring symbols for architectural and electronic layout drawings from MIL-STD-15-3; mechanical symbols from MIL-STD-17; and logic diagram symbols from MIL-STD-806. For required details on the application of graphical symbols refer to ASA Y14.15.

3.7.10 Reference designations. - Electronics reference designations shall conform to MIL-STD-16.

3.8 Production. -

3.8.1 Detail materials, reproduction procedures and assembly shall be approved at time of submission of manuscript for approval. Acceptable production details are set forth in this specification. Alternate methods will be approved if equivalent performance and durability are provided.

3.8.2 Use of color. - Color shall only be used to clarify functional operations. Such methods as cross-hatching or shading shall be used in lieu of color when there will be no loss in comprehension. Color shall not be used for backgrounds or for other decorative purposes. If color is used, a legend shall be included to explain the colors used. Colors shall be held to a minimum.

3.8.3 Typography. - It is not the intent of this specification to state the different methods or composing equipment to be used, but rather to state the results required. All manuals are subject to 35mm microfilming. Letters, lines, and symbols shall be of a uniform contrast throughout the publication. Blurred or smudged printing or drop-out of characters or lines shall be cause for rejection. Characters shall be no smaller than 8-point type. When revisions are made, the typography shall conform as nearly as possible to the original manual. Preferred typography is set forth in table I.

(a) Table I indicates the final point size of the type. When oversize pages are used for composition, the type shall approximate these sizes when reduced.
(b) The type families listed below are most preferred, and can be closely matched by cold composition processes:

Book face (Roman)

Garamond	Bookman
Century	Modern Roman
Modern	Baskerville

(c) Leading and spacing may be relaxed where circumstances require such alterations.